Sampling Episode Report
Holland America Oosterdam
Sampling Episode 6506

Chapter 1
Introduction

March 2006

1.0 INTRODUCTION

This Sampling Episode Report (SER) describes the Environmental Protection Agency's sampling and analysis activities to characterize graywater and sewage generation and treatment by Holland America Cruise Line's cruise ship ms Oosterdam (Oosterdam) while in Alaska waters. This sampling episode took place from September 18 through September 23, 2004, under the direction of the Engineering and Analysis Division of the Office of Science and Technology, and the Oceans and Coastal Protection Division of the Office of Wetlands, Oceans, and Watersheds of the U.S. Environmental Protection Agency (EPA).

The Oosterdam is an 85,000 gross-ton cruise vessel launched in 2003. The vessel has 11 decks, a length of 951 feet, and a beam of 105.8 feet. The Oosterdam's maximum cruising speed is 24 knots. Its port of registry is Rotterdam, Netherlands. During the sampling episode, the Oosterdam carried 1,857 passengers and 768 crew. The ship's itinerary was as follows:

Date	Port
September 18, 2004	Seattle, WA
September 19, 2004	Cruising Inside Passage
September 20, 2004	Juneau, AK
September 21, 2004	Cruising Hubbard Glacier
September 22, 2004	Sitka, AK
September 23, 2004	Ketchikan, AK
September 24, 2004	Victoria, BC

This sampling program is part of EPA's data collection efforts to evaluate whether to develop wastewater discharge standards for cruise vessels authorized to carry 500 or more passengers for hire when operating in the waters of the Alexander Archipelago or the navigable waters of the United States within the State of Alaska or within the Kachemak Bay National Estuarine Research Reserve (hereafter referred to as Alaska waters). Such regulations are authorized by "Title XIV - Certain Alaskan Cruise Ship Operations" of the Miscellaneous Appropriations Bill (H.R. 5666) passed by Congress on December 21,2000 in the Consolidated

Appropriations Act of 2001 (Pub L. 106-554, Sections 1401-1414, 33 USC 1901 Note). The data and information gathered through this sampling episode were collected using EPA's authority under section 308 of the Clean Water Act, as also provided by Title XIV. Holland America Line voluntarily provided information and data gathered for and represented in this report, notwithstanding the above cited authority, in the interest of research for the improvement of wastewater treatment standards.

EPA selected the Holland America Oosterdam to characterize the performance of two ROCHEM UF Systeme GmbH (Hamburg, Germany) wastewater treatment systems. The ROCHEM LPRO treatment system, which is used to treat accommodations and laundry wastewater onboard the Oosterdam, is an advanced wastewater treatment system that uses low pressure osmosis followed by ultraviolet (UV) disinfection. The ROCHEM Bio-Filt® treatment system, which is used to treat sewage, galley wastewater, and membrane concentrate generated by the ROCHEM graywater treatment system onboard the Oosterdam, is an advanced wastewater treatment system that uses aerobic biological oxidation followed by ultrafiltration and UV disinfection. EPA will use the analytical and flow data included in this sampling episode report to evaluate the performance of the ROCHEM graywater and sewage/graywater treatment systems, and to analyze patterns and variability in wastewater sources.

Samples were collected in accordance with procedures specified in the to *Generic Sampling and Analysis Plan for Large Cruise Ships in Alaska Waters* (Generic SAP) and the ship-specific *Sampling and Analysis Plan for Holland America Oosterdam* (Oosterdam SAP). The Oosterdam SAP is presented in Appendix E and the Generic SAP is available on EPA's website at http://www.epa.gov/owow/oceans/cruise_ships/GenericSAP040602.pdf. Pathogen indicator analyses were performed onboards and samples for all other analyses were shipped to shoreside EPA-contract laboratories for analysis. Appendix D identifies all EPA-contract laboratories used in this sampling episode.

Section 2.0 of this SER describes the generation, collection, and treatment of graywater and sewage on the Oosterdam, as well as the sampling point and flow meter locations

used in this sampling episode. Section 3.0 describes the sample collection methods and deviations from the Oosterdam SAP. Section 4.0 presents and analyzes the analytical, flow, and shipboard data collected during the sampling episode. Section 5.0 describes the quality assurance and quality control (QA/QC) procedures and results. Section 6.0 presents references used in this document. Tables and figures referred to in the text are located at the end of each section.